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C-A OPERATIONS PROCEDURES MANUAL

2.5.3 NSRL Accelerator Safety Envelope Parameters

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Hand Processed Changes

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Approved: _____ *Signature on File* _____
Collider-Accelerator Department Chairman Date

E. Lessard

2.5.3 NSRL Accelerator Safety Envelope Parameters

1. **Purpose**

- 1.1 This procedure assigns responsibility for maintaining the Accelerator Safety Envelope Parameters for the National Space Radiation Laboratory. These Parameters are based on the [Accelerator Safety Envelope](#) and any relevant USIs documented using [C-A OPM 1.10.1](#), Unreviewed Safety Issues.
- 1.2 Implicit in the notion of an Accelerator Safety Envelope Parameter is that variations in operating conditions are permitted if and only if they do not exceed the defined boundaries. A variation beyond the boundaries described below shall be treated as a reportable occurrence. Notifications of occurrences shall be made according to [C-A OPM 10.1](#).

2. **Responsibilities**

- 2.1 The C-A Department Chairman shall approve all changes to the Accelerator Safety Envelope Parameters (ASEPs).
- 2.2 The On-Duty Operations Coordinator is responsible for ASEPs in Steps [5.1.1](#), [5.1.2](#), [5.1.3](#), [5.1.4](#), [5.2.1](#), [5.6.1](#), [5.6.2](#) and [5.6.3](#).
- 2.3 The Liaison Physicist for the NSRL is responsible for the ASEPs in Steps [5.2.2](#) and [5.3.1](#).
- 2.4 The Liaison Engineer for the NSRL is responsible for the ASEPs in Steps [5.8.3](#), [5.8.4](#), [5.8.5](#), [5.8.6](#), [5.8.7](#) and [5.8.8](#).
- 2.5 The Head of the Main Control Room is responsible for the ASEPs in Steps [5.4.1](#) and [5.7.1](#).
- 2.4 The Collider-Accelerator Support Group Leader is responsible for the ASEP in Step [5.7.2](#).
- 2.5 The C-A Access Controls Group Leader is responsible for the ASEPs in Step [5.5.1](#), [5.5.2](#), [5.5.3](#), [5.5.4](#), [5.8.1](#) and [5.8.2](#).

3. **Prerequisites**

None

4. **Precautions**

None

5. **Procedure**

Accelerator Safety Envelope Parameters are established for:

- [NSRL Beam Limits in Terms of the Product of Nucleon Energy and Flux](#)
- [Control of Beam Loss](#)
- [Classification of Radiological Areas](#)
- [Completion of RSC and ESRC Checkoff Lists](#)
- [Access Controls During Operations With Beam](#)
- [Fire Protection](#)
- [Staffing](#)
- [Calibration, Testing, Maintenance, and Inspection](#)

5.1 NSRL Beam Limits in Terms of the Product of Nucleon Energy and Flux

- 5.1.1 The on-duty Operations Coordinator shall maintain the annual limit on the number and kinetic energy of high-energy nucleons extracted from the Booster SEB system to less than 10^{17} GeV in one year.
- 5.1.2 The on-duty Operations Coordinator shall maintain the hourly limit on the number and kinetic energy of high-energy nucleons extracted from the Booster SEB system to less than 6×10^{14} GeV in one hour.
- 5.1.3 The on-duty Operations Coordinator shall maintain the hourly limit on the number and kinetic energy of high-energy nucleons entering the NSRL Target Room and beam stop to less than 6×10^{14} GeV in one hour.
- 5.1.4 The on-duty Operations Coordinator shall maintain the maximum annual high-energy flux on the NSRL beam stop to less than 3×10^{16} GeV in one year.

5.2 Control of Beam Loss

- 5.2.1 The on-duty Operations Coordinator shall routinely interpret loss monitoring results and RCT radiation survey results in order to maintain

beam loss “As Low As Reasonably Achievable” as defined in the [BNL Radiological Control Manual](#).

- 5.2.2 When applicable, the Liaison Physicist for the NSRL shall provide the Operations Coordinator with procedures that will control beam loss as follows:

- 5.2.2.1 The Liaison Physicist for the NSRL shall not allow beam-loss induced radiation within NSRL uncontrolled areas to be greater than 0.5 mrem in an hour and for repeated losses greater than 25 mrem in a year.

- 5.2.2.2 The Liaison Physicist for the NSRL shall not allow beam-loss induced radiation within NSRL Controlled Areas to be greater than 5 mrem in an hour and for repeated losses greater than 100 mrem in a year.

5.3 Classification of Radiological Areas

- 5.3.1 The Liaison Physicist for the NSRL shall not allow changes to radiological area classifications at the NSRL before consultation with the Facility Support Representative, the RSC Chair, and the Associate Chair for ESHQ, or their designates. Changes shall be in accord with the requirements in the [BNL Radiological Control Manual](#).

5.4 Completion of RSC and ESRC Checkoff Lists

- 5.4.1 The Head of the Main Control Room shall ensure all relevant RSC, ASSRC and ESRC Checkoff Lists are completed and signed by appropriate personnel before allowing beam into the NSRL or beam for NSRL experimental programs.

5.5 Access Controls During Operations With Beam

- 5.5.1 The Access Controls Group Leader shall ensure that safety-system configuration control and maintenance shall be in accordance with [C-A OPM 4.91](#).
- 5.5.2 The Access Controls Group Leader shall ensure that area radiation monitors that are interfaced with the Access Controls System are within their calibration date.
- 5.5.3 The Access Controls Group Leader shall ensure high intensity proton beam is prevented from the NSRL, either by the Access Controls System or by RSLOTO of appropriate critical devices.

- 5.5.4 The Access Controls Group Leader shall ensure that the locations of area radiation monitors are maintained as defined by the C-A Radiation Safety Committee.

5.6 Fire Protection

- 5.6.1 The on-duty Operations Coordinator shall take appropriate action if fire detection/protection systems are impaired. These actions may either be to prohibit personnel from working in a specific area, and/or to de-energize equipment.
- 5.6.2 The on-duty Operations Coordinator shall allow NSRL magnets and power supplies to be energized if the smoke detection system for the energized area can transmit an alarm to summon the Fire/Rescue Group. Transmittal may be automatic or via a fire watch.
- 5.6.3 The on-duty Operations Coordinator shall allow personnel to occupy the NSRL if the exhaust fans can be activated either manually or automatically.

5.7 Staffing

- 5.7.1 The Head of the Main Control Room shall ensure an adequate number of qualified personnel in the C-A Main Control Room. As a minimum, one Operations Coordinator and one Operator shall be on duty when NSRL beam is in operation. During normal operations, one of the two shall remain in the Main Control Room at all times.
- 5.7.2 The Collider-Accelerator Support Group Leader shall ensure shall ensure a qualified Collider Accelerator Support (CAS) watch person is on duty for NSRL experimental operations with beam.

5.8 Calibration, Testing, Maintenance, and Inspection

- 5.8.1 The Access Controls Group Leader shall ensure the interlocks for radiation safety are functionally tested according to the requirements in [BNL RadCon Manual, Chapter 3, Appendix 3A](#).
- 5.8.2 The Access Controls Group Leader shall ensure the area radiation monitors undergo annual testing (not to exceed 15 months).
- 5.8.3 The Liaison Engineer for the NSRL shall ensure the purge exhaust fan for the NSRL tunnel (17,000 cfm) and the Target Room exhaust fan (900 cfm) undergo annual testing (not to exceed 15 months).
- 5.8.4 The Liaison Engineer for the NSRL shall ensure fire protection systems

undergo annual testing (not to exceed 15 months).

5.8.5 The Liaison Engineer for the NSRL shall ensure radiological barriers undergo annual visual inspection (not to exceed 15 months).

5.8.6 The Liaison Engineer for the NSRL shall ensure rainwater barriers for activated soil undergo annual visual inspection (not to exceed 15 months).

5.8.7 The Liaison Engineer for the NSRL shall ensure Class II Type A biological-safety-cabinet (BSC) HEPA-filter efficiency and cabinet face-velocity-tests are performed *in situ* at the time of installation, at any time the BSC is moved, and at least annually thereafter (not to exceed 15 months).

5.8.8 The Liaison Engineer for the NSRL shall ensure HEPA filter efficiency is tested for the exhaust from animal rooms annually (not to exceed 15 months).

6. Documentation

None

7. References

7.1 [NSRL SAD](#)

7.2 [Accelerator Safety Envelope for NSRL](#)

8. Attachments

None